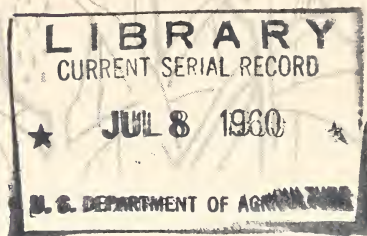


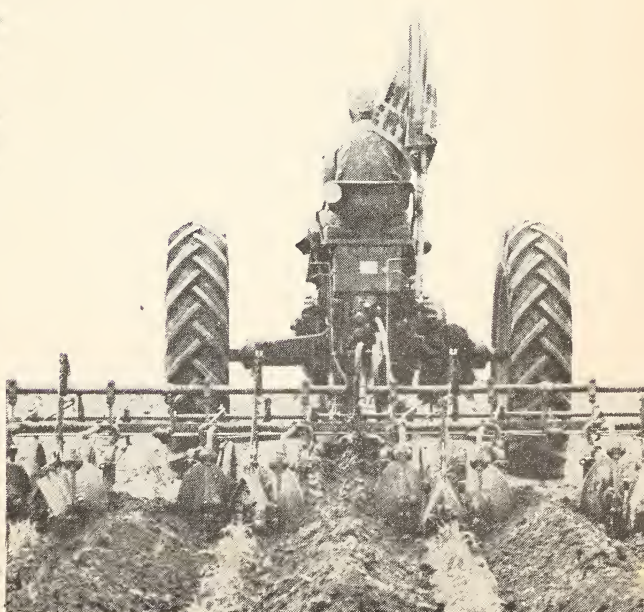
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growing GRAIN SORGHUM



Growing GRAIN SORGHUM

Prepared by Crops Research Division, Agricultural Research Service

Grain sorghum belongs to the grass family and is closely related to Sudan grass, Johnson grass, and broomcorn.

The central and southern Great Plains are the main areas of production in the United States. There, and in some of the irrigated valleys of the Southwest, it is a major crop. Central South Dakota is the northern boundary of the main producing area; the crop usually cannot mature in the cool summer temperatures of latitudes farther north.

Areas where wet, humid weather occurs during the ripening period are not well suited for growing the crop. If grain is damp at this stage of growth it weathers badly and may become covered with a fungus growth.

Dry, warm weather following maturation is desirable; it reduces the moisture content of the grain. This weather condition is normal where most of the crop is grown. However, in areas where wet weather generally prevails during the fall, the crop can be harvested and stored safely if it is dried artificially.

Although grain sorghum is drought tolerant, it responds well to irrigation or rainfall. Yields in excess of 8,000 pounds per acre are not uncommon under conditions of favorable moisture and fertility.

Grain sorghum grows successfully on all types of soil, but in dry seasons it does best on coarse-textured (sandy) soils. Fine-textured (heavy) soils produce a good crop in wet seasons, but as a rule the heavy soils are better suited to wheat production. Sorghum

tolerates considerable quantities of alkali or salts.

Varieties

Most grain sorghums grown in the United States are sturdy-stalked varieties developed especially for combine harvesting. Grain sorghum hybrids, first grown on a field scale in 1956, are rapidly replacing standard varieties. They outyield standard varieties of the same maturity by 20 percent or more. Grain sorghum hybrids are designated by numbers rather than names.

Current lists of recommended hybrids and standard varieties are available on request from your State agricultural extension service.

Seed and Seed Treatment

For best results with standard varieties, purchase certified seed every year; farm-grown seed probably will produce some offtype plants. If you do not buy certified seed, at least buy seed from a reputable dealer.

You must purchase new seeds of hybrid varieties every year to be sure of growing plants that are true to type. In hybrid sorghums, as in hybrid corn, a genetic breakdown occurs the second year.

The cost of high-quality seed is not an important factor in total production costs because it takes so little seed to plant an acre.

Treat all grain sorghum seed with a fungicide before planting. This protects the young seedlings from soil-borne organisms that cause decay.

Nonmercurial compounds are generally used to treat sorghum seed. They may be applied as dusts or slurries. For instructions on treating sorghum seed, consult your county agricultural agent or refer to USDA Miscellaneous Publication 219, Treat Seed Grain.

Seedbed Preparation

Good seedbed preparation is essential in raising grain sorghum. The type of preparation varies with the location.

In much of the Corn Belt and the South, the operations used for corn and cotton are also applicable for sorghum.

In the central and northern Great Plains, sorghum is planted on fallow land or after wheat or sorghum. The best summer fallow tillage methods are those that help store soil moisture and prevent wind erosion. Blades, chisels, one-ways, disk plows, or rod-weeders may be used. Tillage with such equipment leaves some cover and a roughened soil surface for protection during winter months.

Operate blade-type tools at a depth of 5 to 7 inches. This allows much of the plant residue to remain intact. One-way disk plows, which do not cut so deep, function best in years of abundant rainfall when plant growth is heavy.

Chisel plows break up the soil to a depth of 8 to 12 inches and are often used where wind erosion is troublesome during winter and early spring. A moldboard plow is not recommended for seedbed preparation in the central and northern Great Plains except on irrigated land.

In the southern Great Plains, one-way disking is the common initial soil-preparation method on dry land. If the land is irrigated, use a moldboard plow.

Till the land 2, 3, or 4 times before planting sorghum. Frequent tillage is necessary when the spring is wet and weeds grow rapidly. Sorghum often germinates rather slowly, and the small seedlings cannot compete with weeds until about 4 weeks after planting.

Planting

Row planters designed especially for sorghum (fig. 1) are available; many of them are modified listers. Rubber packer wheels are sometimes attached to run behind the planter to improve stands. Corn or cotton planters equipped with sorghum seed plates can be used for planting sorghum. A small-grain drill with some of the planter units closed off also is satisfactory.

Sorghum planters make lower ridges than do conventional listers, but if the soil temperature is low, surface planting is generally better than any form of lister planting.

Sorghum seeds are small and should not be planted too deep—1 to 2 inches is deep enough. The soil around the seed should be firm to obtain rapid moisture absorption, germination, and emergence of the seed.

Many of the older row planters space rows 40 or 42 inches apart, and are not adjustable. Narrower spacing is recommended if you have a planter with which you can adjust spacing. Spacing rows closer together, with plants farther apart in rows, allows plants to make more efficient use of moisture, nutrients, and light. If you intend to cultivate, space rows as closely as 20 inches; exact distance depends on the width of row you can work with your cultivating equipment. If you do not intend to cultivate, do not space rows more than 20 inches apart. Twenty inches is the recom-



Figure 1.—This planter was designed to give the advantages of both surface planting and listing. Furrows are deep enough to assure moisture for seed germination, but they are not so deep that seed is placed in cold soil. The ridges reduce soil blowing, as do lister ridges, but there is less danger of soil washing into furrows and deeply burying seeds.

mended spacing between rows for irrigated crops.

Rate of Planting

Because of the wide variety of soil and fertility and moisture conditions in areas where grain sorghum is grown, only general recommendations for rate of planting can be given. The following rates are for rows spaced 40 inches apart: 3 seeds per foot of row in the driest parts of the Great Plains; 6 seeds per foot of row in parts of the Great Plains that receive the most rainfall; 10 seeds per foot of row in more humid areas such as the Corn Belt, the Delta States, and the Southeast; and 14 seeds per foot of row if the crop is to be irrigated.

If rows are spaced closer, compensate by planting fewer seeds per foot of row. The rate of planting *per acre* should be the same for drilled planting and closely spaced row planting as for planting in rows 40 inches apart. For example, plant half as many seeds per foot of row in 20-inch

spacing as you would plant in 40-inch spacing.

These planting rates are about double the desired plant population—under good seedbed conditions about 50-percent emergence can be expected.

In estimating the amount of seed you should buy, consider seed size as well as planting rate. For the planting rates given above, the amount of average-size seed required for each acre to be seeded is: 2 pounds if the seeding rate is 3 seeds per foot of row; 4 pounds if the seeding rate is 6 seeds per foot of row; 8 pounds if the seeding rate is 10 seeds per foot of row; and 10 pounds if the seeding rate is 14 seeds per foot of row. Buy about one-fourth less seed of exceptionally small-seeded varieties, and about one-fourth more seed of exceptionally large-seeded varieties.

Date of Planting

Soil temperature is the main criterion in determining the planting

date. Sorghum should not be planted until the soil temperature at planting depth is about 70° F.

Most of the grain sorghum is planted between June 1 and June 20 in the Great Plains area that extends from South Dakota into Texas and from the Corn Belt to the Rocky Mountains.

The planting season is longer in the southernmost parts of the Great Plains and in the South. Planting begins about February 25 in the coastal area of Texas and in April in the rest of the South. Quick-maturing varieties may be planted in these areas until mid-July. Late planting in the South often follows small-grain harvest.

If you plant early in the planting season, plant one of the late-maturing varieties adapted to your area; if you plant late in the planting season, plant one of the early-maturing varieties adapted to your area. Many farmers plant a late-maturing variety early in the season; then, if the stand fails, they replant with an early-maturing variety late in the season.

Cultivation

The primary reason for cultivating grain sorghum is to control weeds.

If the rows are spaced 40 or 42 inches apart, an ordinary corn or cotton cultivator works satisfactorily (fig. 2). If the rows are less than 40 inches apart, a special field cultivator or equipment used for beet cultivation works well.

Usually, sorghum planted with a grain drill is not cultivated after emergence. With this type of planting, however, weed-free fields are possible only under the most ideal conditions. A rotary hoe is useful in killing small weeds in drilled sorghum before the plants come up, and is also useful in breaking crusted soil to aid in emergence.

Cultivate shallow and only as often as necessary to control weeds. Deep and too frequent cultivation can seriously damage the roots. Root lodging may be reduced if the soil is mounded around the crowns, particularly at the last cultivation.

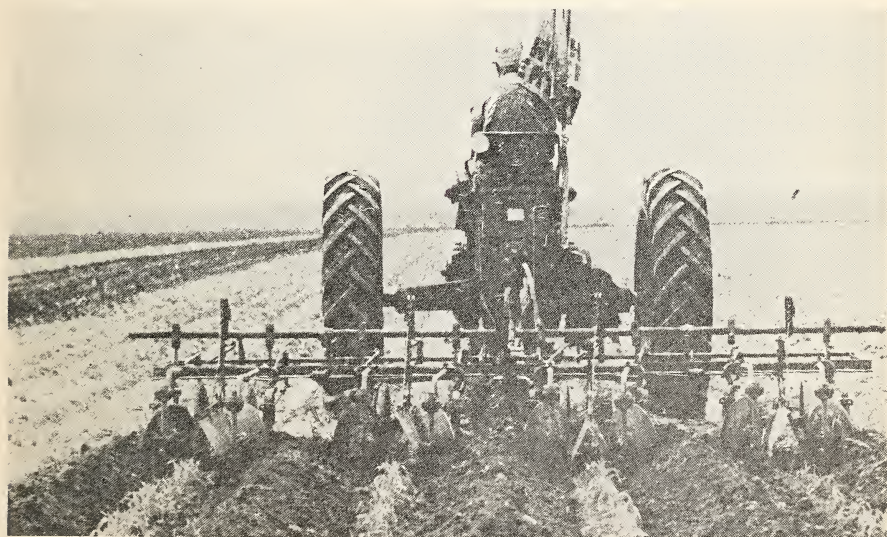


Figure 2.—A corn cultivator throwing dirt away from the young plants in the first cultivation. In the next cultivation it will throw dirt the other way and cover weeds in the row.

Chemical Weed Control

Chemical control of weeds in sorghum is not a substitute for, but rather a supplement to, mechanical cultivation. The most frequently used compound is 2,4-D. It effectively controls broadleaf weeds when they are small, but it does not control grassy weeds.

Under most conditions, 2,4-D should be applied when sorghum is 4 to 10 inches tall, and before it has reached the boot stage. Suggested rates of application are $\frac{1}{4}$ to $\frac{1}{3}$ pound of an ester formulation or $\frac{1}{3}$ to $\frac{1}{2}$ pound of an amine salt formulation per acre.

Grain sorghum is susceptible to 2,4-D; do not apply more than the recommended amount. Place the spray nozzles near the ground so that the sorghum leaves receive as little of the spray as possible.

Fertilizing

Because of extreme variation in soil fertility and rainfall in the sorghum-producing areas of the United States, no specific recommendations for fertilizers are made. Your State extension service or agricultural experiment station can advise what is best for your area. In general, the fertilizer practices suitable for corn will be suitable for sorghum. For best results, apply fertilizer when the plants are young and actively growing. Plants seldom respond to late applications.

Irrigating

Sorghum is a drought-tolerant crop, but it responds well to irrigation. Irrigate before planting on soils with deep profiles if your cropping system allows it. This method makes most efficient use of limited water flow or pumping capacity.

For best results, irrigate grain sorghum before periods of heaviest water usage—booting and heading. Sorghum responds best to irrigation if enough water is applied during these stages to prevent any sign of drought stress. A few heavy waterings are just as effective as more frequent light waterings. Most of the growers who irrigate apply water only 2 to 4 times after planting. A general rule for the amount of water to apply is: 4 inches if the soil is medium or fine textured, and 2 or 3 inches if the soil is coarse and has a low water-holding capacity. It is not advisable to apply water after the grain reaches the dough stage.

If the crop is fertilized and irrigated, coordinate the two practices so that young plants get a good supply of water and nutrients. Water is utilized most efficiently if fertilizer is applied to soil that needs it.

Grain sorghum plantings in the Great Plains States are most commonly irrigated by the graded-furrow method. In some areas gated pipes are popular because they eliminate considerable ditching, prevent ditch-bank erosion, and make possible good control of the water.

Harvesting and Storing

Nearly all the grain sorghum crop is harvested with a combine—after frost in the northern Great Plains, or as soon as the crop is ripe where the growing season is longer.

To keep cracking to a minimum, adjust cylinder speed and concave clearance for sorghum threshing; see your operator's manual for instructions. Set the sickle bar so that as little as possible of the head stalk and foliage will be cut off with the head (fig. 3).

Sorghum grain will thresh free from the head when the moisture content is



Figure 3.—The sickle bar on this combine is set at the right height—it is low enough to get all the heads and high enough to clear most of the leaves.

25 to 30 percent. But in the Great Plains States a moisture content of under 13 percent is essential for safe storage. Eleven percent is recommended for the South, where the humidity is high. Grain does not dry in the bin. In dry areas safe storage is not difficult, but in humid areas storage should be limited to the cold winter months unless the grain has been dried artificially. A musty smell or a clumping of the grain indicates excessive moisture content.

Forced-air drying is the best method for reducing the moisture content of grain sorghum. If the grain is not too damp or the humidity not too high, use unheated air. Under such conditions, drying operations may have to be limited to the drier parts of the day and be extended over a longer period than if heated air is used.

Hot-air drying allows harvesting of the crop before the onset of winter weather and before the stalks become lodged. Air temperature should be kept under 200° F. if the grain is to be fed. If the grain is to be milled, air temperature should not exceed 140°;

if it is to be used for seed, maximum temperature should be 110°.

In years of high grain production in the Great Plains States, storage facilities are usually insufficient to hold the crop. Therefore, much of the grain is piled on the ground for a short period after harvest. Considerable drying takes place in these piles. Piling the grain on clean ground apparently is more satisfactory than piling it on a canvas, wood, or concrete surface, because less moisture collects at the bottom of the pile.

Clean bins thoroughly before storing grain sorghum. Spray walls and floors with a spray that contains methoxychlor, pyrethrins, or malathion. Remove any nearby litter and feed sacks.

Stored grain that becomes infested with insects should be fumigated. Generally, grain sorghum needs higher dosages of fumigant than wheat does because the seeds pack together more closely.

Ask your county agent for publications that give directions on storage and fumigation of grain, or write to the U.S. Department of Agriculture, Washington 25, D.C.

Uses

Feeding Livestock

Grain sorghum is similar chemically to corn. It averages about 2 percent higher in protein and 1 percent lower in fat.

All classes of livestock gain as rapidly on grain sorghum as on corn. Corn is a slightly more efficient feed for beef cattle and hogs; that is, slightly more sorghum is required per pound of gain. Sorghum has about the same feed efficiency as corn for laying hens, broilers, lambs, and dairy cows.

Grain sorghum, in general, is highly palatable to livestock, although some varieties with dark-colored grains are somewhat bitter. Roll, grind, or crack grain for cattle; rolling is best. It is not economical to grind the grain if it is self fed to hogs or sheep. Unthreshed heads, however, should be ground when fed to sheep. For poultry, feed sorghum whole, cracked in scratch feed mixtures, or ground in mash.

Grain sorghum is a carbohydrate feed and, like corn, is most efficiently utilized by livestock when supplemented with protein. Grain sorghum usually is a more economical feed than corn when the two grains are purchased; the lower price of sorghum more than compensates for its slightly lower feeding value.

Grain sorghum stubble may be grazed by cattle or sheep. Grazing utilizes roughage and dropped heads

that might otherwise be wasted. Some varieties have juicy stalks and are particularly valued for grazing. Do not use sorghum fields for grazing if there is green secondary growth; such growth may contain enough prussic acid to poison livestock.

Industrial Uses

Although most of the grain sorghum grown in the United States is fed to livestock, about 7 million bushels are milled annually for starch or flour. The starch is used in building materials, sizings, and adhesives. Important byproducts are livestock feed and oil. Some of the starch is converted to dextrose and used in fruit-canning and confection industries.

Insects and Diseases

Insects that attack grain sorghum include grasshoppers, the corn earworm, the corn leaf aphid, the sorghum midge, the sorghum webworm, and the chinch bug.

For information on insect control, consult your county agent or write to the U.S. Department of Agriculture, Washington 25, D.C.

Diseases attacking grain sorghum may be classified as seed rots and seedling blights, leaf diseases, smuts, root rots, and stalk rots.

Many diseases can be prevented or controlled by growing disease-resistant varieties; by using dry, sound seed; by treating seed with a fungicide; and by planting in warm, mellow soil.

All photographs courtesy of Kansas Agricultural Experiment Station

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